**Ch. 3: Water and the Fitness of the Environment**

**Learning Objective:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ how the properties of \_\_\_\_\_\_\_\_\_ that result from its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ affect its biological function.

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| 1. Why is water important?
 |  |
| 1. What is the “chemistry” of water?

Image result for water molecule with bondsImage result for polarity of water | * Water (H2O) is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* H and O atoms are held together by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Water is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule meaning \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* One water molecule is held to another water molecule by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Water can form up to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ making water “sticky.”

FirefoxScreenSnapz002  |
| **Properties of Water** |
| 1. **COHESION & ADHESION**

**C:\Users\lindsay.faulkner\AppData\Local\Microsoft\Windows\INetCache\Content.MSO\855441D8.tmp**Image result for water capillary action plants | **Cohesion**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Surface tension** = measure of how difficult it is to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of liquid* Ex:

**Adhesion:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Capillary action** - Adhesion of H2O to \_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Ex: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Transpiration** = movement of H2O \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* H2O clings to each other by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; cling to xylem tubes by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 |
| 1. **Good SOLVENT**

**03_07DissolvingSalt-L.jpg**Image result for hydrophilic vs hydrophobic | **Solvent**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Solute**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Solution**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ makes H2O a good \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* polar H2O molecules surround + & – ions
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ dissolve \_\_\_\_\_\_\_\_\_\_\_\_\_ creating \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Hydrophilic*** substances that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* “like” water
* polar or non-polar?
* What would dissolve in water?

**Hydrophobic** * substances that don’t have an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to H2O
* “fear” water
* polar or non-polar?
* What would not dissolve in water?
 |
| *Why does it matter in a cell?* |
| 1. **Low Density Solid**

 | * Why does ice float?
* Why is this important?

1. 2.3.  |
| 1. **HIGH SPECIFIC HEAT**
 | * H2O \_\_\_\_\_\_\_\_\_\_\_ changes in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ \_\_\_\_\_\_\_\_\_\_\_\_ specific heat
	+ takes a \_\_\_\_\_ to \_\_\_\_\_\_\_\_\_ it up
	+ takes a \_\_\_\_\_ to \_\_\_\_\_\_\_\_ it down
* H2O \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ temperatures on Earth
* Why is having a high specific heat important for life on Earth?
 |
| 1. **HIGH HEAT OF VAPORIZATION**
 | the amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ([enthalpy](https://en.wikipedia.org/wiki/Enthalpy)) that must be added to a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ substance, to transform a quantity of that substance into a \_\_\_\_\_\_\_\_\_**Important because of Evaporative Cooling*** Molecules with \_\_\_\_\_\_\_\_\_\_\_\_\_ KE leave as \_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_ temp in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Human \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (cooling)
 |
| 1. **Ionization of water**
 | Water ionizes:\_\_\_\_\_ splits off from H2O, leaving \_\_\_\_\_\_* + - if [H+] = [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- if [H+] > [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
		- if [H+] < [-OH], water is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 |
| 1. http://3.bp.blogspot.com/-7jMoCjWNKkc/UD09TNrx3AI/AAAAAAAAB1g/K488ZLB31rk/s1600/PH-Scale.jpgRecall the pH scale.
 | * Measures how \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ solution is
* Range: \_\_\_ → \_\_\_ → \_\_\_
* **Acids** have an excess of \_\_\_\_\_\_\_ ions, and a pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7.0.
* **Bases** have an excess of \_\_\_\_\_\_\_(hydroxide) ions, and a pH \_\_\_\_\_\_\_\_\_\_\_\_\_\_ 7.0
* What is the pH range of most living things?
 |
| 1. How do **BUFFERS** regulate pH in living things?
 | * Why is pH important?
* What do buffers do?
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| **H2O Property** | **Chemical Explanation** | **Examples of Benefits to Life** |
| Cohesion | * polar
* H-bond
* like-like
 | ↑gravity plants, trees |
| Adhesion | * H-bond
* unlike-unlike
 | plants🡪 xylemblood🡪veins |
| Surface Tension | * diff. in stretch
* break surface
* H-bond
 | bugs🡪water |
| Specific Heat | * Absorbs & retains E
* H-bond
 | ocean🡪mod temp 🡪protect marine life |
| Evaporation | * liquid🡪gas
* KE
 | CoolingHomeostasis |
| Universal Substance | * Polarity🡪ionic
* H-bond
 | Good dissolversolvent |